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Extending the Service Life of Urethane Fuel Tanks

by
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Report Date
March 1992

United States Army
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This report covers the development of an extraction/immersion test procedure for screening of candidate urethane-coated fabrics, used in collapsible fuel storage tanks. Also included are recommended changes in materials requirements for two military specifications which govern procurement of these tanks.

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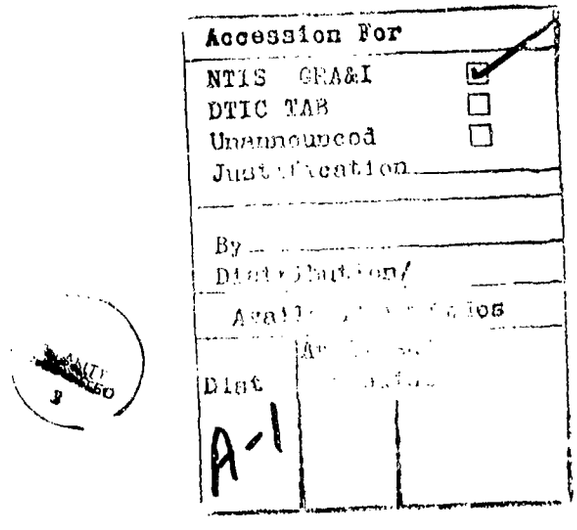
Preface

This report details further investigations conducted and results obtained in a continuing effort to improve the service life of urethane-based collapsible fuel storage tanks. Earlier work has established a correlation between service life and the susceptibility to extraction of stabilizers—additives incorporated in the coating compound to inhibit UV and hydrolytic degradation. An extraction/immersion test procedure, designed to provide comparative data relative to expected performance of candidate urethane coatings, has been evaluated and found to be effective. Proposed changes to two typical fuel tank specifications, incorporating this procedure, are outlined in the appendix to this report.



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Section I

Background

Collapsible fuel tanks, fabricated from urethane-coated nylon fabric, were first introduced into petroleum, oil, and lubricants (POL) field systems during the Vietnam conflict. Their performance then and now—particularly in any humid tropic environment—has been less than satisfactory. Unless formulated and produced according to stringent limitations, urethane-based fabric coatings are extremely susceptible to ultra-violet and hydrolytic degradation, polyesters being more vulnerable than polyethers to hydrolysis. Advancements have been made in understanding the mechanism of the degradative process, and most urethanes now contain chemical stabilizers which, under normal conditions of usage, have proven to be effective. A lingering problem has been the deterioration and ultimate failure of external tank surface areas and seams, even when protective agents have been incorporated into the finished coated fabric. This negative factor has limited the effective service and shelf life of these fuel tanks to one and five years, respectively.

Recently, the US Army Troop Support Command (TROSCOM) issued a directive that these tanks would no longer be used by the Army for long term storage of gasoline fuels. This change in policy allows a shift in emphasis from fuel-resistant coatings to more hydrolytically stable materials; thus, polyethers can now be given more consideration as fabric coatings. Concurrently, Belvoir Research, Development & Engineering Center (BRDEC) Report No. 2488, "Failure Mechanism of Urethane Elastomer Coated Fabric Collapsible Fuel Tanks," by Henry O. Feuer, Jr., and Paul Touchet, dated March 1990, shed a new and highly relevant light on the causes of coating and seam failures on external tank surfaces. Studies by the authors demonstrated unequivocally that these failures were attributable to the leaching out of protective stabilizers by unintentional contact with the contained fuel. The leaching action occurs regardless of the fuel type, but is particularly severe in the case of diesel fuel. Because of this fuel's low volatility and relatively slow evaporation rate, any small spills on the tank surface prolong the extraction process, resulting in more extensive damage.

Further substantiation of the findings contained in the above-cited report can also be found in the paper, "Effects of Extracting Hydrolytic Stabilizers on Urethane Performance," by the same authors, presented at the semi-annual meeting of the Rubber Division-American Chemical Society, October 1990, in Washington, D.C. In a series of controlled tests, samples of urethane coating compounds, wherein the presence or absence of stabilizers was known, were subjected to fuel and water immersion. In some cases, samples were extracted in fuel at room temperature or 70°C prior to immersion in water. Water-aging tests were conducted on extracted and non-extracted specimens for periods as long as 42 days at 70°C. Diesel fuel, conforming to MIL-F-46162C, was chosen for immersion testing, and JP-5/JP-8, conforming to MIL-T-5624N, was chosen for the combined extraction/immersion procedure. Requirements cited in these documents are very tightly controlled, enhancing credibility as "reference fuels." A direct correlation was established among the factors: type of urethane, type of fuel, stabilizer content, and whether a fuel extraction was conducted prior to immersion in water.

Heretofore, military specifications for fuel tanks have merely based requirements for hydrolytic stability on the urethane's ability to retain a certain percentage of original tensile properties after immersion in distilled water at 70°C for 14 and 42 days. While this testing does serve to ascertain the material's hydrolytic stability, no assessment is made of the combined effects of both fuel and water. As emphasized in the above-cited work, this can be accomplished by inserting, in relevant tank specifications, an extraction/immersion test conducted at 70°C to simulate the extreme (humid tropic) environment encountered in-service. By extracting specimens in an agreed-upon reference fuel (such as JP-5/JP-8 ST) prior to the 14- and 42-day water immersion, a more exact indication of expected in-service performance is obtained. Additionally, urethanes that are inadequately stabilized can be screened out, thus reducing the possibility of acceptance of inferior-coated fabrics while assuring procurement of tanks with longer shelf and service life.

This report summarizes additional testing performed on urethane coatings, coated fabrics, and seams to further substantiate the need for a combined extraction/immersion procedure. Also, to exemplify how the procedure can be implemented in fuel tank specifications, revised performance criteria for two such documents are presented herein.

Section II

Investigation

MATERIALS USED

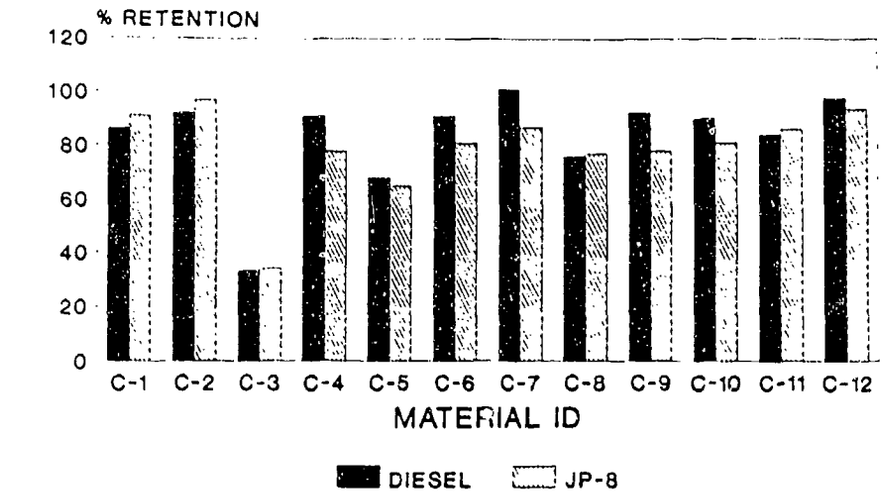
Twelve urethane compounds and five urethane-coated fabrics were selected for evaluation and comparison of performance characteristics. Some of these materials were known to be poor choices for use in fuel tanks, but were intentionally included to further demonstrate the relevance, interrelationship, and effect on performance of factors, such as type of urethane and presence or absence of stabilizers. Certain industrial suppliers, although willing to provide sample materials, were reluctant to divulge compositional information. Therefore, rather than infringe on proprietary rights, all samples were coded and no sources are disclosed herein. Limited structural details are included within generated data tables.

TESTS CONDUCTED

Table 1 (page A-2) lists the tests conducted on the coating compound and coated fabric specimens, and the applicable test procedures employed. Certain aspects of the test plan, such as prolonged immersions for 14 and 42 days and drying in a vacuum oven at reduced pressure, deviate from ASTM or FTMS 191 recommendations. However, such modifications are cited in current fuel tank specifications, and were deemed necessary here to extract data which would more precisely demonstrate the relationship between material composition factors and comparative hydrolytic stability. End item specifications contain a much more extensive variety of physical and mechanical materials qualification tests. The abridged test plan used was designed to address specific issues.

RESULTS

Table 2 (page A- 4) summarizes results obtained for all tests conducted on the twelve urethane coating materials. Table 3 (page A- 5) contains similar data as generated during testing of the five candidate urethane-coated fabrics. Figures 1, 2, and 3, are graphical representations of selected data presented to aid interpretation and highlight material performance factors.



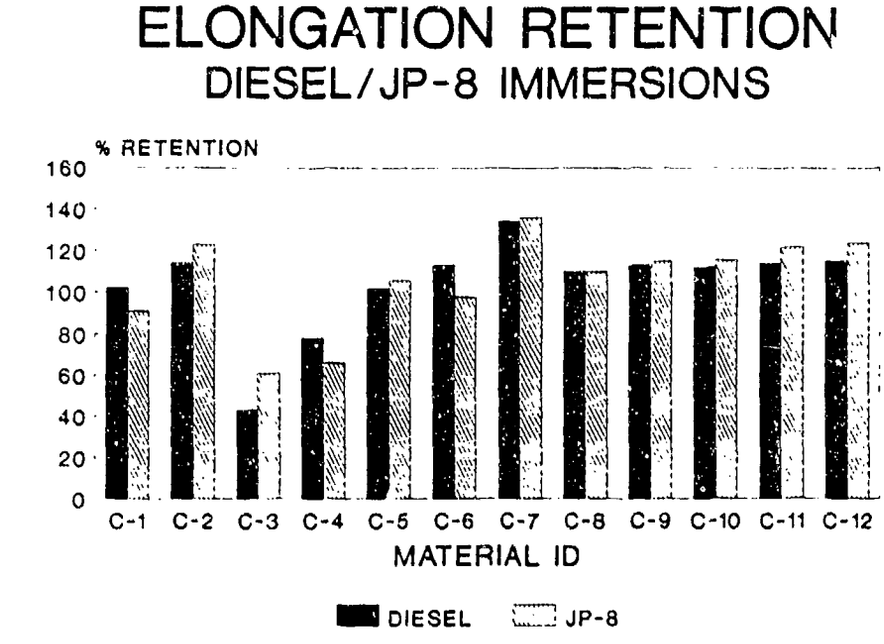
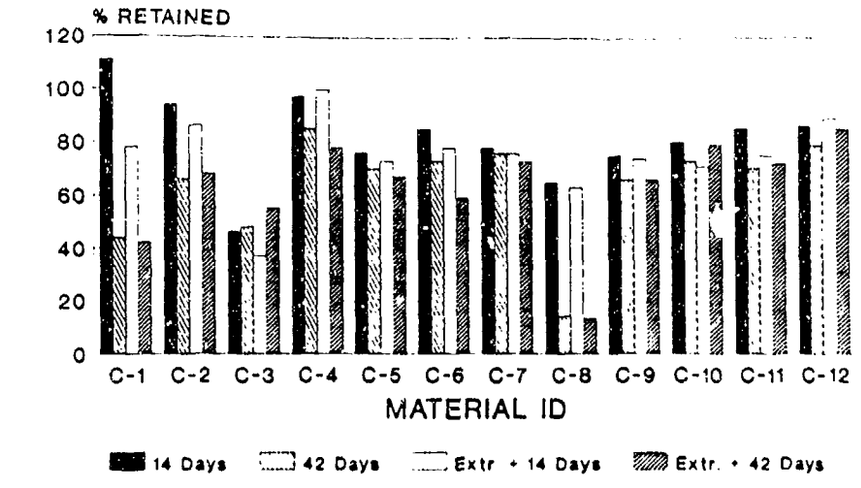


Figure 1. Tensile and Elongation Retention Diesel/JP-8 Immersion



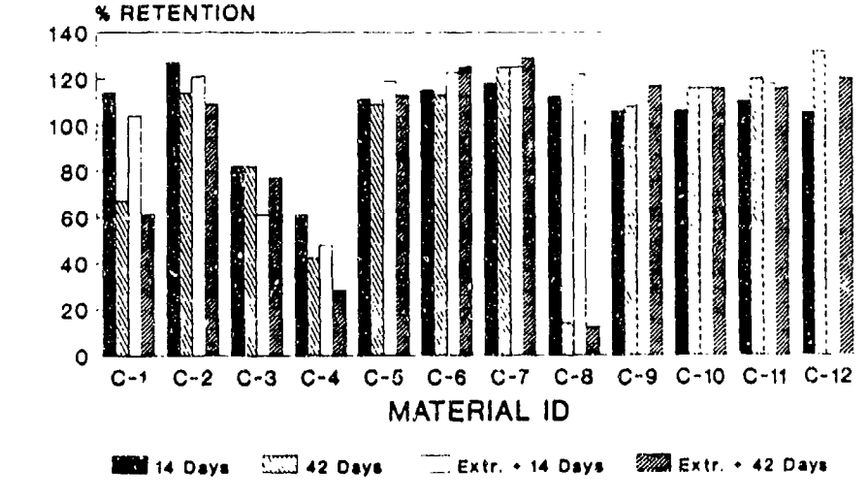
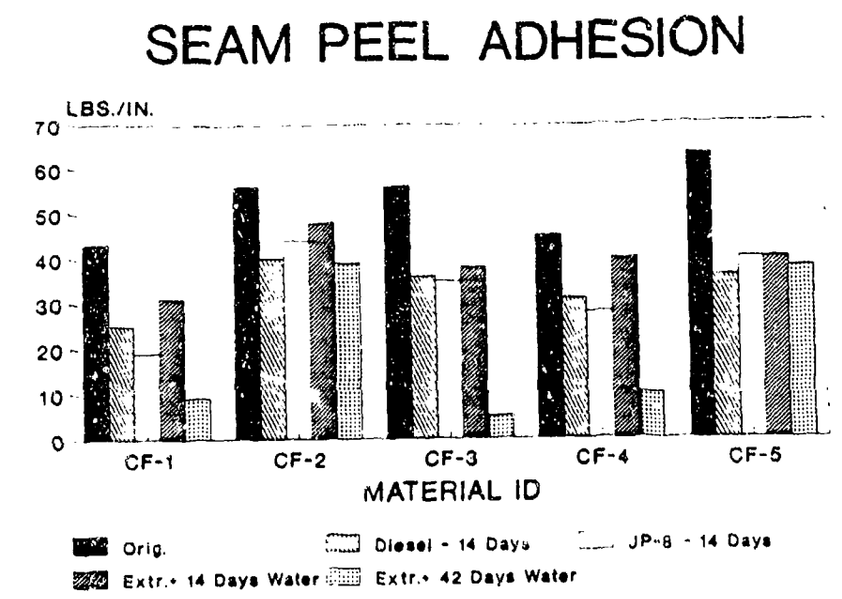


Figure 2. Tensile and Elongation Retention Water Immersion



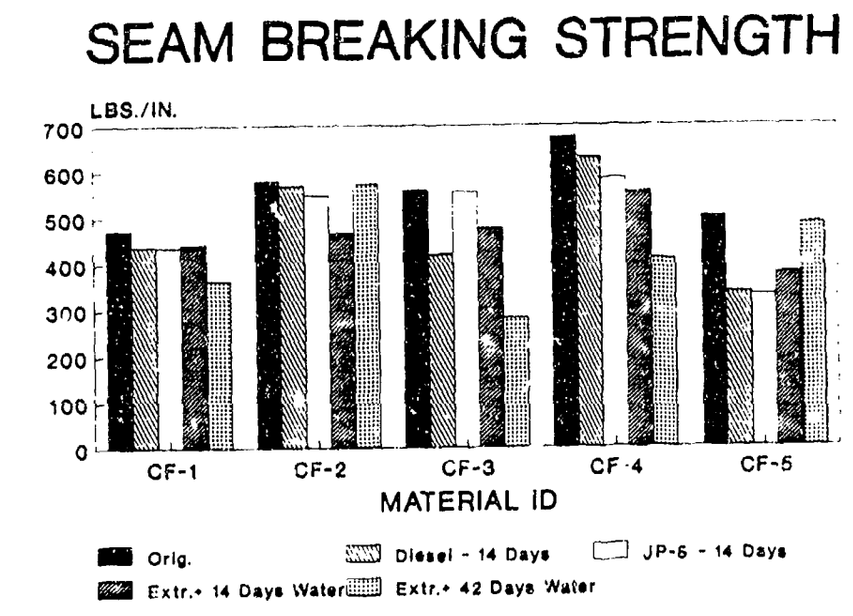


Figure 3. Seal Peel Adhesion and Breaking Strength Coated Fabrics

Section III
Discussion

COATING COMPOUNDS

As indicated in the heading of Table 2 (page A-4), the twelve compounds selected represent a good cross-section of materials currently provided by industry suppliers—ethers, esters, and blends thereof, some with and some without stabilizers. All have relatively high tensile strength, elongation, and 200% moduli. Retention of original properties after immersion in diesel fuel or JP-8 was found to be acceptable for most, regardless of whether ether or ester-based. As depicted graphically in Figure 1, results were mixed, and the extent of property loss was essentially equal for both diesel fuel and JP-8. Only compounds C-3, C-4, and C-5 would be considered as definitely unacceptable. Ironically, compound C-7 performed well despite having a volume swell of over 20% in each fuel. Unwashed and heptane-washed existent gum content was judged excellent for all materials, limits usually being less than 20 and 5 gms/ml, respectively.

A dramatic illustration of the positive effects of the presence of stabilizers in urethane coating compounds is evident when the data generated from 14- and 42-day immersions in distilled water of unextracted and JP-8-extracted specimens are examined. Figure 2 highlights this graphically. The ether-based compound C-3 exhibited poor water resistance after only 14 days immersion. Unstabilized compounds, such as C-1 and C-8, exhibit marked and parallel declines in tensile and elongation retention after 42 days exposure, while C-4 (of unknown composition) displayed volume swells in excess of 40%. The subsequent decline in tensile retention after extended immersion of stabilized compounds C-2, C-6, and C-9, appears sufficient to indicate a slight to moderate amount of extraction of their respective additives. Conversely, the performance of compound C-10, under all conditions of exposure, was judged excellent and indicative that little or no stabilizer extraction took place. In general, the fuel extraction procedure does not seem to adversely affect the water resistance of properly stabilized ester or unstabilized ether urethanes, and can apparently provide a better estimation of expected long-term performance.

COATED FABRICS

Data generated in testing of the five candidate coated fabrics contained in Table 3 (page A-5) is supplemented by Figure 3, a graphical representation of comparative performance of fabricated seams in peel and shear breaking strength tests. The relatively low weight (33 to 36 ounces per square yard) and high breaking strength of these materials coincide with known advantages of urethanes as coatings and laminates; namely, low density without sacrificing ability to withstand weathering and abrasion. In order to attain equivalent weight to breaking strength ratios using other conventional coating materials, such as nitrile or epichlorohydrins/ethylene oxide (ECO), one would have to resort to heavier base fabrics and/or thicker coatings. Coating adhesion tests normally require specially prepared samples having a reinforcing backup strip. These specimens could not be obtained from material suppliers, thus the test could not be conducted. Tear strength and puncture resistance of all candidates were excellent, and those that were ester-based tended to display slightly higher values. The seemingly anomalous high warp tear strength of CF-4 (99 pounds) is probably attributable to an unusual base fabric weave. JP-8 diffusion rates were low (considering the fuel's high volatile content), and well within limits imposed in current fuel tank specifications.

SEAMS

The seam structures furnished by coated fabric suppliers were lap joint and heat-sealed, rather than adhesive-bonded. When employed properly, heat-sealing can provide acceptable joints. Heat-sealing is often preferred because it is less labor-intensive and more expeditious. All seam peel adhesion failures occurred between the coating and the nylon fabric, underscoring the importance of coating adhesion. Peel adhesion of unaged specimens ranged from 43 to 63 pounds per inch, and dropped to 19 to 44 pounds per inch after aging in diesel fuel or JP-8. Here, performance in either fuel was essentially the same. Two of the seam structures (CF-2 and CF-5) are currently being used in fabrication of collapsible water tanks. They both demonstrated excellent peel adhesion (>38 pounds per inch) after fuel extraction and long-term water immersion. All others displayed adequate adhesion after extraction and immersion for 14 days, but values dropped to 10 pounds per inch or less after further water aging for 42 days. This can be seen in the first graph of Figure 3.

Seam shear breaking strength data of Table 3, and as shown graphically in the second portion of Figure 3, again indicates preference for the two ether-based materials, CF-2 and CF-5. Values here, even after JP-8 extraction and 42 days of distilled water immersion, were still essentially equal to those obtained initially from unaged specimens. Ester-based CF-1 also displayed good property retention after extraction/immersion, while CF-3 and CF-4 (ester and ether-based, respectively), evidenced moderate strength losses. None of the seams failed the dead load slippage test, conducted at 180°F under a stress of 50 pounds per inch. These findings substantiate the need for extraction/immersion testing and emphasize that a candidate urethane-coated fabric's potential as a fuel tank material cannot be judged merely on the basis of urethane type and stabilizer content.

Section IV

Interpretation and Implementation

EXTRACTION/IMMERSION TEST PROCEDURE

It is readily apparent from the previous discussion that an extraction/immersion test procedure would predict the performance potential of collapsible fuel tanks constructed of urethane-coated fabric. A simple test performed on candidate materials prior to end item fabrication would tell the fabricator whether any potential exists for catastrophic tank failures in the field induced by accidental fuel spillage on exposed surfaces. As proposed for inclusion in relevant specifications, the procedure is as follows:

1. Immerse the specimens in JP-5/JP-8 ST fuel conforming to MIL-T-5624 for 7 days at 160° ± 2°F.
2. Remove specimens from fuel and blot with paper towels.
3. Place specimens in a vacuum drying oven for 16 hours ± 2 hours at 120° ± 2°F, at a reduced pressure of 20 inches of Mercury.
4. Immerse specimens in distilled water for the specified period, usually 14 and 42 days, at 160° ± 2°F.
5. Determine physical properties— as applicable to coating compounds, coated fabrics, or seams—on the aged specimens.

APPLICATION TO MILITARY SPECIFICATIONS

Implementation of the new test procedure in relevant fuel tank specifications has already been initiated. Modifications to the currently active versions of two such documents, MIL-T-52983E, "Tank, Fabric, Collapsible, 3,000, 10,000, 20,000, and 50,000 Gallon, Petroleum," and MIL-T-53066, "Tank, Fabric, Collapsible, 5,000 Barrel Petroleum," have been drafted. Suggested changes included not only those related to the extraction/immersion procedure, but others deemed necessary on the basis of additional information generated in this and other in-house fuel tank materials investigations. Adjustments have been made to preclude imposition of excessive demands (overdesign), and provide an equitable and attainable balance of

properties. Some instances are encountered where a proposed requirement is less stringent than that now cited. Tables 4 through 7 (pages A-6 through A-9), contain the recommended replacements for Tables I through IV of MIL-T-52983, and Tables 8 through 11 (pages A-10 through A-13), contain corresponding replacements for Tables II through V of MIL-T-53066E. Footnotes detailing deviations from normal practices and/or explicit directives are included for each table. Drafts of the proposed changes to each specification have been submitted to the documents' custodian.

Significant benefits would be derived from further application of the extraction/immersion test procedure. It is recommended that all specifications covering fuel containment and storage tanks wherein urethane-coated fabrics are used be reviewed and, if applicable, similar changes implemented. It is quite probable that tank service life could be extended from one to five years, and the storage life from five to ten or twenty years.

Section V

Conclusions

1. Current specifications for collapsible fuel storage tanks, based on urethane-coated fabrics, do not contain effective materials requirements to preclude inadequate resistance of the coatings to the deteriorative effects of ultra-violet and hydrolysis.

2. Even though a urethane-coated fabric is purported to contain ultra-violet and hydrolytic stabilizers, resistance of these chemical additives to surface extraction by incidental contact with fuels must be verified.

3. Use of separately conducted fuel and water immersion tests to ascertain the acceptability of a urethane-coated fabric falls short of providing meaningful information regarding expected performance.

4. A procedure which employs initial extraction in JP-5/JP-8 ST, followed by immersion in water at 160°F for a minimum of 42 days, will effectively screen out unsuitable candidate urethane coating compounds. The end item coated fabrics must be highly stable in order to withstand the demanding and deteriorative effects of the environment.

5. The proposed extraction/immersion procedure should be incorporated in all military specifications wherein urethane-coated fabrics are utilized.

6. Implementation of the cited procedure in future urethane fuel tank procurement actions could potentially provide end items having double the shelf and storage life of those currently in service.

Appendix of Tables

Table 1. Tests and Test Procedures

TEST	TEST PROCEDURES
A. Coating Compounds	
1. Tensile Strength, Initial	ASTM D 412
2. Elongation, Initial	ASTM D 412
3. 200% Modulus, Initial	ASTM D 412
4. Properties after Fuel Immersion in MIL-F-46162 Diesel or MIL-T-5624 JP-5/JP-8 ST Fuels for 14 Days at 160°F	ASTM D 471
a. Tensile, Elongation, Modulus, and Volume Swell	ASTM D 471 & ASTM D 412
5. Properties after Immersion in Distilled Water at 160°F for 14 and 42 Days	ASTM D 471 & ASTM D 412
a. Tensile, Elongation, Modulus, and Volume Swell	
6. Properties after Fuel Extraction in JP-8 for 7 Days at 160°F, then Dried in a Vacuum Oven at 120°F and 20 inches of Mercury for 16 Hours	
a. Water Immersion 14 and 42 Days at 160°F	ASTM D 471 & ASTM D 412
1. Tensile, Elongation, Modulus, and Volume Swell	
7. Fuel Contamination	
a. Existent Gum	Para 4.5.2.11 of MIL-T-52983
b. Heptane Washed Gum	Para 4.5.2.9 of MIL-T-53066
B. Coated Fabrics	
1. Original	
a. Weight	Meth 5041 FTMS 191
b. Diffusion Rate of JP-8	Para 4.5.2.10 of MIL-T-53066 or Para 4.5.2.12 of MIL-T-52983
c. Tear & Breaking Strength	Meth 5134 & 5102 of FTMS 191
d. Puncture Resistance	Meth 5120 FTMS 191

Table 1. Tests and Test Procedures (continued)

TEST	TEST PROCEDURES
C. Seams	
1. Original	
a. Breaking Strength	Meth 8311 FTMS 191
b. Seam Peel Adhesion	ASTM D 413, Machine
2. After Immersion in Diesel and JP-8 Fuels for 14 Days at 160°F	ASTM D 471
a. Breaking Strength	Meth 8311 FTMS 191
b. Seam Peel Adhesion	ASTM D 413, Machine
3. After Fuel Extraction and Dried, then Immersed in Distilled Water for 14 and 42 Days at 160°F	ASTM D 471
a. Breaking Strength	Meth 8311 FTMS 191
b. Seam Peel Adhesion	ASTM D 413, Machine
4. Dead Load Slippage	Para 4.5.2.16 of MIL-T-53066 Para 4.5.2.19 of MIL-T-52983D

Table 2. Properties of Coating Compounds for Collapsible Fuel Tanks

MATERIALS ID CODE	C-1	C-2	C-3	C-4	C-5	C-6	C-7	C-8	C-9	C-10	C-11	C-12
MATERIAL TYPE	Est/Eth	Est/Eth	Ether	?	?	Ester	Ether	Ester	Ether	Ester	Ether	Ether
STABILIZER	None	Stab. P	None	?	?	Yes	?	None	Yes	Yes	UV	UV
COATING COMPOUNDS												
Original Properties												
Tensile Strength, psi	3510	4020	4330	2740	4590	5810	4370	6210	5940	5300	5740	6170
Elongation, %	510	440	510	640	530	480	560	490	560	490	490	410
200% Modulus	2500	2830	1580	1750	1300	2180	1280	2510	2100	2170	1850	3030
After Immersion in Diesel, 14 days at 160°F												
Tensile Retention, %	86	92	33	91	68	91	101	76	92	90	84	98.1
Elongation Retention, %	102	114	43	78	102	113	134	110	113	112	114	115
Modulus Retention, %	73	74	86	98	86	70	84	67	73	71	74	59.1
Volume Swell, %	4.65	5.86	23.39	5.46	24.51	8.61	24.65	7.47	17.45	17.26	9.37	8.25
After Immersion in JP-8, 14 days at 160°F												
Tensile Retention, %	91	97	34	78	65	81	87	77	78	81	80	93 5
Elongation Retention, %	104	123	61	66	106	98	136	110	115	116	122	124
Modulus Retention, %	75	72	85	89	80	59	79	59	69	66	70	55.4
Volume Swell, %	4.57	7.04	24.02	6.76	22.95	9.6	23.22	7.4	16.05	16.05	9.36	8.73
Existent Gum												
Unwashed, grams/ml	0.40	0.80	3.80	5.60	4.80	1.20	5.20	1.80	2.80	2.40	2.00	1.20
Heptane-Washed, grams/ml	0.40	0.80	0.80	2.60	0.60	0.20	1.60	1.40	1.40	0.60	1.80	0.80
After Immersion in Distilled Water For 14 days at 160°F												
Tensile Retention, %	111	94	46	97	76	85	78	65	75	80	84.7	85.9
Elongation Retention, %	114	127	82	61	111	115	118	112	106	106	110	105
Modulus Retention, %	68	73	80	125	84	67	91	63	71	70	76	63
Volume Swell, %	1.37	1.61	0.75	44.94	0.47	6.65	0.93	0.97	0.19	0.33	1.67	1.51
For 42 days at 160°F												
Tensile Retention, %	44	66	48	85	70	73	76	14	66	73	70	78.9
Elongation Retention, %	67	114	82	42	109	113	125	14	108	116	120	132
Modulus Retention, %	53	66	80	127	84	70	81	—	70	71	75	60
Volume Swell, %	1.12	1.34	0.45	52.25	0.34	7.23	0.84	1.13	0.25	0.74	1.54	1.41
After Immersion with JP-8 and Dried Water Immersion 14 Days at 160°F												
Tensile Retention, %	78	86	37	100	73	78	76	63	74	71	75	89
Elongation Retention, %	104	121	61	48	119	123	125	122	110	116	118	124
Modulus Retention, %	56	69	81	140	79	59	77	61	71	67	70	56
Volume Swell, %	4.08	4.98	3.09	48.91	2.04	8.54	2.24	3.92	2.39	2.52	4.1	5.81
Water Immersion 42 Days at 160°F												
Tensile Retention, %	42	68	55	78	67	59	73	13	66	79	72	84.8
Elongation Retention, %	61	109	77	28	113	125	129	12	117	116	116	120
Modulus Retention, %	56	66	144	—	80	57	78	—	70	71	72	58.1
Volume Swell, %	3.61	4.97	2.45	50.34	1.83	9.82	2.33	4.28	0.72	1.11	3.25	4.79

Table 3. Properties of Polyurethane-Coated Fabrics for Collapsible Fuel Tanks

MATERIALS ID CODE COATING TYPE, INTERIOR/EXTERIOR	CF-1 Est/Eth	CF-2 Eth/Eth	CF-3 Est/Est	CF-4 Eth/Eth	CF-5 Eth/Eth
COATED FABRICS					
Original Properties					
Weight, oz/sq yd	33	36	33	33	35
Breaking strength, lb/in					
Warp	704	738	752	817	740
Fill	590	572	560	752	562
Tear Strength, lb					
Warp	67	35	57	39	37
Fill	68	37	46	99	37
Puncture Strength, lb	261	223	242	227	229
Diffusion with JP-8, oz/sq yd/ 24 hours					
Original Material at Room Temperature	0.03	0.043	0.097	0.037	0.048
JP-8 Extracted + 7 Days at –25°F	0.074	0.066	0.104	0.045	0.058
SEAM MATERIALS					
Peel Adhesion, lb/in					
Original	43	56	56	45	63
After Immersion in Diesel 14 Days at 160°F	25	40	36	31	36
After Immersion in JP-8 14 Days at 160°F	19	44	35	28	40
After Extraction in JP-8 and Dried					
Immersion in Water 14 Days at 160°F	31	48	38	25	40
Immersion in Water 42 Days at 160°F	9	39	5	10	38
Shear Breaking Strength, lb/in					
Original	472	579	558	674	499
After Immersion in Diesel 14 Days at 160°F	438	568	419	629	335
After Immersion in JP-8 14 Days at 160°F	435	548	556	584	329
After Extraction in JP-8 and Dried					
Immersion in Water 14 Days at 160°F	441	466	476	553	377
Immersion in Water 42 Days at 160°F	363	573	282	408	485
Dead Load Slippage, inches	<0.1	<0.1	<0.1	<0.1	<0.1

NOTE: Coating adhesion samples could not be obtained. Seam peel adhesion failures occurred between coating and fabric.

Table 4. Proposed Replacement for Table I of MIL-T-52983E

TABLE I. CHARACTERISTICS OF COATING COMPOUNDS. 1/

TEST PROPERTY	REQUIREMENTS (ALL TANK SIZES)	TEST PARAGRAPH AND ASTM TEST METHODS
ORIGINAL PROPERTIES		
TENSILE STRENGTH, PSI. (MIN)	1500 (1500)	D 412
ULTIMATE ELONGATION, % (MIN)	300 (300)	D 412
PROPERTIES AFTER FUEL IMMERSION IN TEST FLUID 2/ AT 160 F FOR 14 DAYS		D 471 (PARA 14.1, 14.2, &10.1)
TENSILE STRENGTH RETAINED,% (MIN)	80 (65)	
ELONGATION RETAINED,% (MIN)	80 (--)	
VOLUME SWELL,% (MAX)	25 (--)	
PROPERTIES AFTER FUEL EXTRACTION, DRIED, AND THEN IMMERSED IN DISTILLED WATER AT 160 F FOR THE FOLLOWING DURATIONS: 3/		D 471 (PARA 14.1, 14.2, &10.1) & 4.5.2.XX 9/
14 DAYS		
TENSILE STRENGTH RETAINED,% (MIN)	75 (--)	
ELONGATION RETAINED,% (MIN)	80 (--)	
VOLUME SWELL,% (MAX)	10 (--)	
42 DAYS		
TENSILE STRENGTH RETAINED,% (MIN)	70 (--)	
ELONGATION RETAINED,% (MIN)	75 (--)	
VOLUME SWELL,% (MAX)	10 (--)	
RESISTANCE TO LIGHT AFTER 1500 HOURS ACCELERATED WEATHERING AT 10% ELONGATION 4/.		D 750 6/ OR D 2565 7/
TENSILE STRENGTH RETAINED,% (MIN)	80 (80)	
FUEL CONTAMINATION: 5/		
EXISTENT GUM,UNWASHED,MG/100ML (MA	20 (20)	4.5.2.11
HEPTANE WASHED GUM, MG/100 ML (MAX)	5 (5)	4.5.2.11
OZONE RESISTANCE	NO CRACKS UNDER 7X LENS	D 1149 8/

Notes for Table I

1 ASTM test slabs shall be of same composition and cure as coating compounds.

2 Immersion test fluid shall be diesel fuel conforming to MIL-F-46162.

3 JP-5/JP-8 ST conforming to MIL-T-5624N will be used as extraction media.

4 Applicable to all exterior coating compounds. That is, all coating compounds between the nylon cloth and the outside of the tank.

5 Applicable to all interior coating compounds and seam covering materials. That is, coating compounds between nylon cloth (including any coatings or seam covering tapes) and the inside of the tank.

6 Alternate Corex D filters in place.

7 ASTM Method D 2565, Xenon Light, Procedure A, inner and outer borosilicate filters; deionized water (20 ± 3°C); cycle: 690 minutes light exposure, 30 minutes light and gray; black panel temperature of 63 ± 3°C; relative humidity (45 ± 5%).

8 Test Method A specimen shall be conditioned for 14 days at a temperature of 104 ± 3.6°F (40 ± 2°C) having a partial pressure of ozone of 50 millipascals.

9 (Proposed new paragraph) 4.5.2.XX

Fuel Extraction. Test specimens shall be prepared in accordance with the tests to be performed in Tables I – IV and then submitted to the following extraction procedure.

a. Immerse the specimen in JP-5/JP-8 ST fuel conforming to MIL-T-5624N, for 7 days at 160 ± 2°F.
b. Remove specimen from fuel and blot with paper towels.
c. Place specimens in a vacuum oven for drying for 16 ± 2 hours at 120 ± 2°F at 20 inches of Mercury.
d. Samples will then be immersed in distilled water as required in Tables I – IV.

Table 5. Proposed Replacement for Table II of MIL-T-52983E

TABLE II CHARACTERISTICS OF COATED FABRIC.

TEST PROPERTY	REQUIREMENTS TANK CAPACITY (GALLONS) 3,000	10,000	20,000	50,000	TEST PARAGRAPH, TEST METHOD OF FED-STD-191 OR ASTM TEST METH
WEIGHT (OZ/SQ YD)	30 MIN-62 MAX (30 MIN-62 MAX)				5041
DIFFUSION RATE 1/ FL OZ/SQ FT/24 HR, MAX.	12 (.1)	.12 (.1)	.12 (.1)	.12 (.1)	4.5.2.12
TEAR STRENGTH, W & F LB., MINIMUM	30 (25)	30 (25)	40 (35)	40 (35)	5134
BREAKING STRENGTH, W & F, LB/IN, MIN	400 (350)	400 (350)	550 (500)	550 (500)	5102
PUNCTURE RESISTANCE LBS . MINIMUM	200 (110)	200 (110)	200 (150)	200 (150)	4.5.2.14/5120
WEATHERING RESISTANCE 1500 HRS EXPOSURE & 5% ELONGATION, WARP & FILL					5804 4/, D 2565 5/ AND 5102
BREAKING STRENGTH RETENTION, %, MIN	80 (80)	80 (80)	80 (80)	80 (80)	
LOW TEMPERATURE CREASE RESISTANCE 1/					
APPEARANCE	NO CRACKING, PEELING, OR DELAMINATION UNDER 7X LENS				4.5.2.15
DIFFUSION RATE FL OZ/SQ FT/24 HRS, MAX	12 (.1)	.12 (.1)	.12 (.1)	12 (.1)	4.5.2.12
FUNGUS RESISTANCE	NO CRACKING, BLISTERING, OR DELAMINATION OF COATING				5762 6/ & 5102
BREAKING STR. RETAINED WARP & FILL, %, MIN	80 (--)	80(--)	80 (--)	80 (--)	
BLOCKING	SEPARATE WITHIN 5 SECONDS				4.5.2.16
COATING ADHESION					4.5.2.17 &
INITIAL, LB/IN, MIN	30 (20)	30 (20)	30 (20)	30 (20)	4.5.2.17.1
AFTER FUEL IMMERSION 2/ FOR 14 DAYS AT 160 F					D 471 4.5.2.17 &
LB/IN, MIN	20 (10)	20 (10)	20 (10)	20 (10)	4.5.2.17.1
AFTER FUEL EXTRACTION 1/ DRIED, AND IMMERSION IN WATER AT 160 F FOR					D 471, 4.5.2.17, 4.5.2.17.1, & 4.5.2.XX 3/
14 DAYS, LB/IN, MIN	20 (--)	20 (--)	20 (--)	20 (--)	
42 DAYS, LB/IN, MIN	15 (--)	15 (--)	15 (--)	15 (--)	

Notes for Table II

1 JP-5/JP-8 ST conforming to MIL-T-5624N will be used as extraction media.

2 Immersion test fluid shall be diesel fuel conforming to MIL-F-46162.

3 (Proposed new paragraph) 4.5.2.XX

Fuel Extraction. Test specimens shall be prepared in accordance with the tests to be performed in Tables I – IV and then submitted to the following extraction procedure.

a. Immerse the specimen in JP-5/JP-8 ST fuel conforming to MIL-T-5624N, for 7 days at 160 ± 2°F.
b. Remove specimen from fuel and blot with paper towels.
c. Place specimens in a vacuum oven for drying for 16 ± 2 hours at 120 ± 2°F at 20 inches of Mercury.
d. Samples will then be immersed in distilled water as required in Tables I – IV.

4 Alternate Corex D filters in place. Coated fabric specimens shall have exterior coating (outside of tank) facing the carbon arc.

5 ASTM Method D 2565, Xenon Light, Procedure A, inner and outer borosilicate filters; deionized water (20 ± 3°C); cycle: 690 minutes light exposure, 30 minutes light and gray; black panel temperature of 63 ± 3°C; relative humidity (45 ± 5%). Coated fabric specimens shall have exterior coating (outside of tank) facing the light.

6 Except that the specimens shall be prepared per Method 5102 of FED-STD-191 and the number of specimens shall be reduced from 40 to 5 warp and 5 fill. Leaching of specimens is unnecessary. The specimens shall be exposed to the soil for eight weeks.

Table 6. Proposed Replacement for Table III of MIL-T-52983E

TABLE III CHARACTERISTICS OF SEAMS

TEST PROPERTY	REQUIREMENTS TANK CAPACITY (GALLONS) 3,000	10,000	20,000	50,000	TEST PARAGRAPH OR TEST METHOD OF FED-STD-191 OR ASTM TEST METHOD
BREAKING STRENGTH,					
INITIAL, LB/IN, MIN	400 (350)	400 (350)	550 (500)	550 (500)	D 751, METH B 1/, 4.5.2.18
AFTER IMMERSION IN FUEL 2/ AT 160 F FOR 14 DAYS, LB/IN, MIN	290 (315)	290 (315)	400 (400)	400 (400)	D 751, METH B, 4.5.2.18, & D 471 (PAR 15.2)
AFTER FUEL EXTRACTION 3/, DRIED, AND IMMERSION IN DISTILLED WATER AT 160 F FOR					4.5.2.XX4/, 4.5.2.18, D 471 (PAR 15.2), & D751 METH B
14 DAYS, LB/IN, MIN	325 (---)	325 (---)	450 (---)	450 (---)	
42 DAYS, LB/IN, MIN	290 (---)	290 (---)	400 (---)	400 (---)	
DEAD LOAD SHEAR RESISTANCE UNDER 50 LB/IN STRESS AT 180 F FOR 8 HOURS	0.125 IN SLIPPAGE (MAX) (.1)				4.5.2.19
SEAM PEEL ADHESION					
INITIAL, LB/IN, MIN	30 (20)	30 (20)	30 (20)	30 (20)	D 413 MACHINE METHOD
AFTER FUEL IMMERSION 2/ FOR 14 DAYS AT 160 F LB/IN, MIN	20 (10)	20 (10)	20 (10)	20 (10)	D 471 (PAR 15.2), D 413 MACHINE METHOD
AFTER FUEL EXTRACTION 3/, DRIED, AND IMMERSION IN DISTILLED WATER AT 160 F FOR FOLLOWING DURATIONS:					D 413 MACHINE METH, D4.5.2.18, D 471 (PAR 15.2), 4.5.2.XX4/.
14 DAYS, LB/IN, MIN	20 (--)	20 (--)	20 (--)	20 (--)	
42 DAYS, LB/IN, MIN	15 (--)	15 (--)	15 (--)	15 (--)	

Notes for Table III

1/ All specimens must break in the coated fabric. Failure of any specimen in a seam area shall constitute failure of the test.

2/ Immersion test fluid shall be diesel fuel conforming to MIL-F-46162.

3/ JP-5/JP-8 ST conforming to MIL-T-5624N will be used as extraction media.

4/ (Proposed new paragraph) 4.5.2.XX

Fuel Extraction. Test specimens shall be prepared in accordance with the tests to be performed in Tables I – IV and then submitted to the following extraction procedure.

a. Immerse the specimen in JP-5/JP-8 ST fuel conforming to MIL-T-5624N, for 7 days at 160 ± 2°F.
b. Remove specimen from fuel and blot with paper towels.
c. Place specimens in a vacuum oven for drying for 16 ± 2 hours at 120 ± 2°F at 20 inches of Mercury.
d. Samples will then be immersed in distilled water as required in Tables I – IV.

Table 7. Proposed Replacement for Table IV of MIL-T-52983E

TABLE IV. CHARACTERISTICS OF BONDED FITTINGS.

TEST PROPERTY	REQUIREMENTS TANK CAPACITY (GALLONS) 3,000	10,000	20,000	50,000	TEST PARAGRAPH OR TEST METHOD OF FED-STD-191 OR ASTM TEST METHOD
ALUMINUM TO COATED FABRIC BOND, BREAKING STRENGTH, INITIAL, LB/IN, MIN	400 (350)	400 (350)	550 (500)	550 (500)	4.5.2.20 & 4.5.2.20.1
AFTER IMMERSION IN FUEL 1/ AT 160 F FOR 14 DAYS, LB/IN, MIN	290 (315)	290 (315)	400 (400)	400 (400)	D 471(PAR 15.2) 4.5.2.20 & 4.5.2.20.2
AFTER FUEL EXTRACTION 2/, DRIED, AND IMMERSION IN DISTILLED WATER AT 160 F FOR					D 471(PAR 15.2) 4.5.2.20 , 4.5.2.20.2 & 4.5.2.XX 3/
14 DAYS, LB/IN, MIN	325 (---)	325 (---)	450 (---)	450 (---)	
42 DAYS, LB/IN, MIN	290 (---)	290 (---)	400 (---)	400 (---)	
DEAD LOAD SHEAR RESISTANCE UNDER 50 LB/IN STRESS AT 180 F FOR 8 HOURS	0.125 IN SLIPPAGE (MAX) (.1)				4.5.2.19 & 4.5.2.20.3
PEEL ADHESION OF ALUMINUM STRIP TO COATED FABRIC INITIAL, LB/IN, MIN	30 (20)	30 (20)	30 (20)	30 (20)	D 429, METHOD B AND 4.5.2.21
AFTER FUEL IMMERSION 1/ FOR 14 DAYS AT 160 F LB/IN, MIN	20 (10)	20 (10)	20 (10)	20 (10)	D 471(PAR 15.2), D 429, METHOD B 4.5.2.21, & 4.5.2.21.1
AFTER FUEL EXTRACTION 2/, DRIED, AND IMMERSION IN DISTILLED WATER AT 160 F FOR FOLLOWING DURATIONS:					D 471(PAR 15.2), D 429, METHOD B, 4.5.2.21, 4.5.2.21.1, & 4.5.2.XX 3/
14 DAYS, LB/IN, MIN	20 (--)	20 (--)	20 (--)	20 (10)	
42 DAYS, LB/IN, MIN	15 (--)	15 (--)	15 (--)	15 (--)	

Notes for Table IV

1 Immersion test fluid shall be diesel fuel conforming to MIL-F-46162.

2 JP-5/JP-8 ST conforming to MIL-T-5624N will be used as extraction media.

3 (Proposed new paragraph) 4.5.2.XX

Fuel Extraction. Test specimens shall be prepared in accordance with the tests to be performed in Tables I – IV and then submitted to the following extraction procedure.

a. Immerse the specimen in JP-5/JP-8 ST fuel conforming to MIL-T-5624N, for 7 days at 160 ± 2°F.
b. Remove specimen from fuel and blot with paper towels.
c. Place specimens in a vacuum oven for drying for 16 ± 2 hours at 120 ± 2°F at 20 inches of Mercury.
d. Samples will then be immersed in distilled water as required in Tables I – IV.

Table 8. Proposed Replacement for Table II of MIL-T-53066

TABLE II CHARACTERISTICS OF COATING COMPOUNDS.[1]

TEST PROPERTY	REQUIREMENTS	TEST PARAGRAPH AND ASTM TEST METHODS
ORIGINAL PROPERTIES		
TENSILE STRENGTH, PSI (MIN)	1500 (1500)	D 412
ULTIMATE ELONGATION, % (MIN)	300 (300)	D 412
PROPERTIES AFTER FUEL IMMERSION IN TEST FLUID[2] AT 160 F FOR 14 DAYS		D 471 (PARA 14 1, 14 2, &10 1)
TENSILE STRENGTH RETAINED, % (MIN)	80 (60)	
ELONGATION RETAINED, % (MIN)	80 (--)	
VOLUME SWELL, % (MIN)	25 (--)	
PROPERTIES AFTER FUEL EXTRACTION, DRIED, AND THEN IMMERSED IN DISTILLED WATER AT 160 F FOR THE FOLLOWING DURATIONS.[3]		D 471 (PARA 14 1, 14 2, &10.1; & 4 5.2.XX[9]
14 DAYS		
TENSILE STRENGTH RETAINED, % (MIN)	75 (--)	
ELONGATION RETAINED, % (MIN)	80 (--)	
VOLUME SWELL, % (MIN)	10 (--)	
42 DAYS		
TENSILE STRENGTH RETAINED, % (MIN)	70 (--)	
ELONGATION RETAINED, % (MIN)	75 (--)	
VOLUME SWELL, % (MIN)	10 (--)	
RESISTANCE TO LIGHT AFTER 1500 HOURS ACCELERATED WEATHERING AT 10% ELONGATION[4]		D 750[6] OR D 2565[7]
TENSILE STRENGTH RETAINED, % (MIN)	80 (80)	
FUEL CONTAMINATION:[5]		
EXISTENT GUM, UNWASHED, MG/ML (MAX)	20 (20)	4 5.2.9
HEPTANE WASHED GUM, MG/ML (MAX)	5 (5)	4.5.2.9
OZONE RESISTANCE	NO CRACKS UNDER 7X LENS	D 1149[8]

Notes for Table II

[1] ASTM test slabs shall be of same composition and cure as coating compounds.

[2] Immersion test fluid shall be diesel fuel conforming to MIL-F-46162.

[3] JP-5/JP-8 ST conforming to MIL-T-5624N will be used as extraction media.

[4] Applicable to all exterior coating compounds. That is, all coating compounds between the nylon cloth and the outside of the tank.

[5] Applicable to all interior coating compounds and seam covering materials. That is, coating compounds between nylon cloth (including any coatings or seam covering tapes) and the inside of the tank.

[6] Alternate Corex D filters in place.

[7] ASTM Method D 2565, Xenon Light, Procedure A, inner and outer borosilicate filters; deionized water (20 ± 3°C); cycle: 690 minutes light exposure, 30 minutes light and gray; black panel temperature of 63 ± 3°C; relative humidity (45 ± 5%).

[8] Test Method A specimen shall be conditioned for 14 days at a temperature of 104 ± 3.6°F (40 ± 2°C) having a partial pressure of ozone of 50 millipascals.

[9] (Proposed new paragraph) 4.5.2.XX
Fuel Extraction. Test specimens shall be prepared in accordance with the tests to be performed in Tables I – IV and then submitted to the following extraction procedure.

a. Immerse the specimen in JP-5/JP-8 ST fuel conforming to MIL-T-5624N, for 7 days at 160 ± 2°F.
b. Remove specimen from fuel and blot with paper towels.
c. Place specimens in a vacuum oven for drying for 16 ± 2 hours at 120 ± 2°F at 20 inches of Mercury.
d. Samples will then be immersed in distilled water as required in Tables I – IV.

Table 9. Proposed Replacement for Table III of MIL-T-53066

TABLE III. CHARACTERISTICS OF COATED FABRIC.

TEST PROPERTY	REQUIREMENTS	TEST PARAGRAPH, TEST METHOD OF FED-STD-191 OR ASTM TEST METHOD
WEIGHT (OZ/SQ YD)	40 MIN, 62 MAX	5041
DIFFUSION RATE 1/ FL OZ/SQ FT/24 HR, MAX.	.12 (.1)	4.5.2.10
TEAR STRENGTH, WARP & FILL LB., MINIMUM	50 (50)	5134
BREAKING STRENGTH, WARP & FILL, LB/IN, MIN	600 (600)	5102
PUNCTURE RESISTANCE LBS., MINIMUM	225 (170)	4.5.2.11/5120
WEATHERING RESISTANCE 1500 HRS AT 5% ELONG, W & F BREAK STRENGTH RETENTION, %, MIN.	80 (80)	5804 4/ OR D 2565 5/ AND 5102
LOW TEMPERATURE CREASE RESISTANCE 1/ APPEARANCE AFTER UNFOLDING	NO CRACKING, PEELING, OR DELAMINATION UNDER 7X LENS	4.5.2.12
DIFFUSION RATE FL OZ/SQ FT/24 HRS, MAX	.12 (.1)	4.5.2.10
FUNGUS RESISTANCE APPEARANCE	NO CRACKS, BLISTERS, OR DELAMINATION OF COATING	5762 2/ & 5102
BREAKING STRENGTH, RETAINED WARP & FILL, %, MIN	80 (50)	
BLOCKING	SPECIMENS TO SEPARATE WITHIN 5 SECONDS	4.5.2.13
COATING ADHESION		4.5.2.14 &
INITIAL, LB/IN, MIN	30 (35)	4.5.2.14.1
AFTER FUEL IMMERSION 2/ FOR 14 DAYS AT 160 F LB/IN, MIN	20 (25)	D 471, 4.5.2.14 & 4.5.2.14.1
AFTER FUEL EXTRACTION 3/, DRIED, AND IMMERSED IN WATER AT 160 F FOR:		D 471, 4.5.2.14, 4.5.2.14.1, & 4.5.2.XX 3/
14 DAYS, LB/IN, MIN	20 (--)	
42 DAYS, LB/IN, MIN	15 (--)	

Notes for Table III

1 JP-5/JP-8 ST conforming to MIL-T-5624 will be used for diffusion and extraction.

2 Immersion test fluid shall be diesel fuel conforming to MIL-F-46162.

3 (Proposed new paragraph) 4.5.2.XX
Fuel Extraction. Test specimens shall be prepared in accordance with the tests to be performed in Tables I – IV and then submitted to the following extraction procedure.

a. Immerse the specimen in JP-5/JP-8 ST fuel conforming to MIL-T-5624N, for 7 days at 160 ± 2°F.
b. Remove specimen from fuel and blot with paper towels.
c. Place specimens in a vacuum oven for drying for 16 ± 2 hours at 120 ± 2°F at 20 inches of Mercury.
d. Samples will then be immersed in distilled water as required in Tables I – IV.

4 Alternate Corex D filters in place. Coated fabric specimens shall have exterior coating (outside of tank) facing the carbon arc.

5 ASTM Method D 2565, Xenon Light, Procedure A, inner and outer borosilicate filters; deionized water (20 ± 3°C); cycle: 690 minutes light exposure, 30 minutes light and gray; black panel temperature of 63 ± 3°C; relative humidity (45 ± 5%). Coated fabric specimens shall have exterior coating (outside of tank) facing the light.

6 Except that the specimens shall be prepared per Method 5102 of FED-STD-191 and the number of specimens shall be reduced from 40 to 5 warp and 5 fill. Leaching of specimens is unnecessary. The specimens shall be exposed to the soil for eight weeks.

Table 10. Proposed Replacement for Table IV of MIL-T-53066

TABLE IV. CHARACTERISTICS OF SEAMS

TEST PROPERTY	REQUIREMENTS	TEST PARAGRAPH, TEST METHOD OF FED-STD-191 OR ASTM TEST METHOD
BREAKING STRENGTH, 1/		
INITIAL, LB/IN, MIN	600 (600)	D 751 METH B 1/
AFTER IMMERSION IN FUEL 2/ AT 160 F FOR 14 DAYS, LB/IN, MIN	450 (450)	4 5.2.15, D 471 (PARA 15 2), & D 751 METH B
AFTER FUEL EXTRACTION 3/, DRIED, AND IMMERSION IN DISTILLED WATER AT 160 F FOR		4.5.2.15, D 471 (PARA 15 2) 4 5 2.19, & D 751 METH B
14 DAYS, LB/IN, MIN	450 (450)	
42 DAYS, LB/IN, MIN	400 (400)	
DEAD LOAD SHEAR RESISTANCE UNDER 60 LB/IN STRESS AT 180 F FOR 8 HOURS	0.125 IN SLIPPAGE (MAX)	4 5.2.16
SEAM PEEL ADHESION		
INITIAL, LB/IN, MIN	30 (35)	D 413 MACHINE METHOD
AFTER FUEL IMMERSION 2/ FOR 14 DAYS AT 160 F LB/IN, MIN	20 (25)	D 471 (PARA 15.2) & D 413 MACHINE METHOD
AFTER FUEL EXTRACTION 3/, DRIED, AND IMMERSION IN DISTILLED WATER AT 160 F FOR FOLLOWING DURATIONS:		D 471 (PARA 15.2) D 413 MACHINE METH 4.5.2.XX 4/
14 DAYS, LB/IN, MIN	20 (--)	
42 DAYS, LB/IN, MIN	15 (--)	

Notes for Table IV

[1] All specimens must break in the coated fabric. Failure of any specimen in a seam area shall constitute failure of the test.

[2] Immersion test fluid shall be diesel fuel conforming to MIL-F-46162. .

[3] JP-5/JP-8 ST conforming to MIL-T-5624N will be used as extraction media.

[4] (Proposed new paragraph) 4.5.2.XX

Fuel Extraction. Test specimens shall be prepared in accordance with the tests to be performed in Tables I – IV and then submitted to the following extraction procedure.

a. Immerse the specimen in JP-5/JP-8 ST fuel conforming to MIL-T-5624N, for 7 days at 160 ± 2°F.
b. Remove specimen from fuel and blot with paper towels.
c. Place specimens in a vacuum oven for drying for 16 ± 2 hours at 120 ± 2°F at 20 inches of Mercury.
d. Samples will then be immersed in distilled water as required in Tables I – IV.

Table 11. Proposed Replacement for Table V of MIL-T-53066

TABLE V. CHARACTERISTICS OF BONDED FITTINGS.

TEST PROPERTY	REQUIREMENTS	TEST PARAGRAPH, TEST METHOD OF FED-STD-191 OR ASTM TEST METHOD
ALUMINUM TO COATED FABRIC BOND, BREAKING STRENGTH, INITIAL, LB/IN, MIN	600 (600)	4.5.2.17 & 4.5.2.17.1
AFTER IMMERSION IN FUEL 1/ AT 160 F FOR 14 DAYS, LB/IN, MIN	450 (450)	4.5.2.17 & 4.5.2.17.2
AFTER FUEL EXTRACTION 2/, DRIED, AND IMMERSION IN DISTILLED WATER AT 160 F FOR 14 DAYS, LB/IN, MIN	450 (---)	4.5.2.17, 4.5.2.17.2, & 4.5.2.19
42 DAYS, LB/IN, MIN	400 (---)	
DEAD LOAD SHEAR RESISTANCE UNDER 60 LB/IN STRESS AT 180 F FOR 6 HOURS	0.125 IN SLIPPAGE (MAX)	4.5.2.17.3
PEEL ADHESION OF ALUMINUM STRIP TO COATED FABRIC INITIAL, LB/IN, MIN	30 (40)	D 429, METHOD B, 4.5.2.18 & 4.5.2.18.1
AFTER FUEL IMMERSION 1/ FOR 14 DAYS AT 160 F LB/IN, MIN	20 (25)	D 429, METHOD B, 4.5.2.18 & 4.5.2.18.1
AFTER FUEL EXTRACTION 2/, DRIED, AND IMMERSION IN DISTILLED WATER AT 160 F FOR FOLLOWING DURATIONS:		D 429, METHOD B, 4.5.2.18, 4.5.2.18.1 AND 4.5.2.XX 3/
14 DAYS, LB/IN, MIN	20 (--)	
42 DAYS, LB/IN, MIN	15 (--)	

Notes for Table V

1 Immersion test fluid shall be diesel fuel conforming to MIL-F-46162.

2 JP-5/JP-8 ST conforming to MIL-T-5624N will be used as extraction media.

3 (Proposed new paragraph) 4.5.2.XX

Fuel Extraction. Test specimens shall be prepared in accordance with the tests to be performed in Tables I – IV and then submitted to the following extraction procedure.

a. Immerse the specimen in JP-5/JP-8 ST fuel conforming to MIL-T-5624N, for 7 days at 160 ± 2°F.
b. Remove specimen from fuel and blot with paper towels.
c. Place specimens in a vacuum oven for drying for 16 ± 2 hours at 120 ± 2°F at 20 inches of Mercury.
d. Samples will then be immersed in distilled water as required in Tables I – IV.

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